UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/530,994	09/07/2005	Othmar Zuger	UNX-002	2169

23701 7590 12/27/2006

RAUSCHENBACH PATENT LAW GROUP, LLC
P.O. BOX 387
BEDFORD, MA 01730

EXAMINER	
COLEMAN, WILLIAM D	
ART UNIT	**PAPER NUMBER**
2823	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/27/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/530,994	ZUGER, OTHMAR	
	Examiner	Art Unit	
	W. David Coleman	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *September 7, 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *40-81* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *40-56,58,59,62-66 and 69-81* is/are rejected.

7)☒ Claim(s) *57,60 and 61* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *09/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

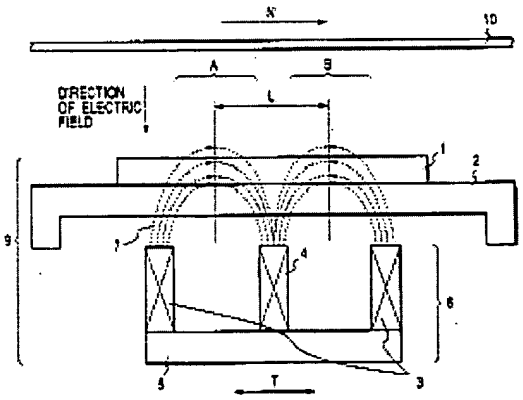
Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 40-56, 58, 59, 62-66 and 69-81 are rejected under 35 U.S.C. 102(b) as being anticipated by Tamura et al., U.S. Patent 6,093,290.

3. Tamura discloses a method of magnetron sputtering as claimed. See **FIGS. 1-11**, where Tamura teaches the following limitations.



4. Pertaining to claim 40, Tamura teaches a method of magnetron sputtering, the method comprising:

a) providing a magnetron source **6** with a sputter surface **1**, the magnetron source generating a magnetron magnetic field pattern **7** along the sputter surface;

b) cyclically moving said magnetron magnetic field pattern along said sputter surface (see column 3, line12-14, where Tamura teaches reciprocating the magnetic flux);

c) positioning a substrate to be coated a distance from and facing said sputter surface;

d) moving said substrate along said sputter surface; and

e) varying an amount of material deposited on said substrate per time unit from said magnetron source that is cyclically and phase-locked with said cyclically moving said magnetron magnetic field pattern (because Tamura discloses a roll-to-roll system and the film forming region is requires uniform thickness as disclosed in column 6, lines 8-35, Tamura also discloses moving the magnetic flux in a circular pattern as described in column 2, lines 35-36).

5. Pertaining to claim 41, Tamura teaches the method of claim 40 further comprising cyclically moving said magnetron magnetic field pattern in tow dimensions (please note that circular movement has two dimensions, namely an x-coordinate and a y-coordinate).

6. Pertaining to claim 42, Tamura teaches the method of claim 40 further comprising cyclically moving said magnetron magnetic filed in at least one of a rotational pendular manner and a rotational manner with respect to an axis perpendicular to said sputter surface (please see the rejection of claim 41 above for explanation of the present claim).

7. Pertaining to claim 43, Tamura teaches the method of claim 40 further comprising cyclically varying said amount of material simultaneously along the entire sputter face (this step

is inherent to all magnetron sputtering systems that move the magnetic flux in a circular direction).

Pertaining to claim 44, Tamura teaches the method of claim 40 further comprising varying said amount of material by varying at least one of a flow of a reactive gas and a flow of a working gas into an area between said sputter surface and said substrate (in this case the reactive gas is a dopant gas, see column 2, lines25-28 for the dopant gas and the working gas is argon, see column 8, lines 65-68 for the working gas).

8. Pertaining to claim 45, Tamura teaches the method of claim 40 further comprising varying said amount of material by controlling a power applied to said magnetron source (because the magnetron reveals a sinusoidal pattern in **FIG. 3**, the claim limitation is met).

9. Pertaining to claim 46, Tamura teaches the method of claim 40 further comprising varying said amount of material with a time course having a frequency spectrum with a significant spectral line at a double frequency of a fundamental frequency of cyclically moving said magnetron magnetic field pattern (please see the field flux in FIG. 10, where the frequency of the flux has been doubled).

10. Pertaining to claim 47, Tamura teaches the method of claim 46, wherein said time course has a further significant spectral line at the fundamental frequency of cyclically moving said magnetron magnetic field pattern (please note that the term "significant" is a relative term and

since Applicants provide no further meaning or definition in the claims, Tamura meets this limitation).

11. Pertaining to claim 48, Tamura teaches the method of claim 40 further comprising tailoring said magnetron magnetic field pattern symmetrically to an axis in a plane which is parallel to said sputter surface (please see FIG. 1).

12. Pertaining to claim 49, Tamura teaches the method of claim 40, further comprising tailoring said magnetron magnetic field pattern symmetrically with respect to tow mutually perpendicular axes in a plane which is parallel to said sputter surface (as explained above since Tamura teaches a circular pattern of the magnetron, this limitation is met).

13. Pertaining to claim 50, Tamura teaches the method of claim 40 further comprising applying a reactive gas into an area between said sputter surface and said substrate (please note, gases by their vary nature performs this limitation).

14. Pertaining to claim 51, Tamura teaches the method of claim 40 wherein said sputter surface comprises a circular surface (please note that it is well known that sputter target come in many different shapes and that this limitation is not an inventive feature).

15. Pertaining to claim 52, Tamura teaches the method of claim 40 further comprising not influencing a material flow distribution from said sputter surface to said substrate (because the

rest of the process chamber is not at a higher potential there is no influence on material flow distribution and the material deposits as a line-of-site deposition).

16. Pertaining to 53, Tamura teaches the method of claim 40 further comprising selecting a time course of varying said amount of material with respect to at least one of a relative movement between the substrate and the sputter surface, a shape of said magnetron field pattern, and a movement course of said magnetron magnetic field pattern (this appears as a design choice because all sputtering material erode at different process parameters due to the nature of their composition).

17. Pertaining to claim 54, Tamura teaches the method of claim 40 further comprising time varying a course of varying said amount of material (this is a well know design choice because it depends on the dimensions of the roll-to-roll substrate).

18. Pertaining to claim 55, Tamura teaches the method of claim 40 further comprising monitoring a distribution of material momentarily deposited on said substrate, comparing said monitored distribution with a desired distribution, and adjusting characteristics of varying said amount of material as a function of a difference between said desired distribution and said monitored distribution (please note that it is well known to provide a quartz crystal microbalance in the process chamber to measure film thickness, since the monitor is in a fixed position, the process of using a magnetron sputtering system which moves along a path of the sputtering target will inherently have a varied deposition characteristic).

19. Pertaining to claim 56, Tamura teaches the method of claim 40 further comprising moving said substrate along sputter surface (this is self explanatory).

20. Pertaining to claim 58, Tamura teaches the method of claim 40 further comprising moving said substrate alone sputter surface linearly as considered in a view towards said sputter surface.

21. Pertaining to claim 59, Tamura teaches the method of claim 40 further comprising moving said substrate within a plane parallel to said sputter surface.

22. Pertaining to claim 62, Tamura teaches the method of claim 40 further comprising moving said substrate along a circular trajectory path as considered in a view towards said sputter surface about a center remote from said sputter surface.

23. Pertaining to claim 63, Tamura teaches the method of claim 40 further comprising superposing to said varying of said amount of material a further varying of said amount synchronized with said moving of said substrate.

24. Pertaining to claim 64, Tamura teaches the method of claim 40 wherein an optimized homogeneous coating thickness distribution is achieved on said substrate (this homogeneous distribution is desired in all semiconductor coating processes).

25. Pertaining to claim 65, Tamura teaches the method of claim 40 wherein an optimized homogeneous distribution of material stoichiometry is achieved along the coating of said substrate (by the vary nature of semiconductor device, designing a device to have a certain mobility will inherently require the understanding of material stoichiometry).

26. Pertaining to claim 66, Tamura teaches the method of claim 40 wherein the method of magnetron sputtering comprises a method of coating planar substrates.

27. Pertaining to claim 69, Tamura teaches a magnetron sputtering apparatus comprising:

a) a magnetron sputter source having a sputter target with a sputter surface and a magnet arrangement, said magnet arrangement being coupled to a drive to be cyclically moved along a plane parallel to said sputter surface (because magnetrons operate at reduced pressures, it would be inherent to provide a remote procedure to move the magnetron);

b) a substrate conveyor arrangement for moving at least one substrate along said sputter surface; and

c) a modulation arrangement cyclically modulating the amount of material per time unit sputtered off said sputter surface, said modulation arrangement being phased locked with said drive.

28. Pertaining to claim 70, Tamura teaches the apparatus of claim 69 wherein said drive comprises one of a rotational pendular drive that generates rotational pendulum movement and a rotational drive that generates a rotational movement of said magnet arrangement with respect to

an axis that is perpendicular to said sputter surface (please see the rejection above addressing the circular motion of the magnetron).

29. Pertaining to claim 71, Tamura teaches the apparatus of claim 69, wherein said modulation arrangement modulates the amount of sputtered off material per time unit simultaneously along the entire sputter surface (please note that when the magnetron sputtering system came on the market about 30 years ago, the targets were expensive and the erosion was vary inconsistent, by oscillating the magnetic flux, non-uniform erosion improved. It is still important that an arrangement is met to provide a uniform film thickness of deposited film performed by magnetron sputtering).

30. Pertaining to clam 72, Tamura teaches the apparatus of claim 69 wherein said modulation arrangement comprises at least one of a reactive gas flow and a working gas flow adjusting member (it is well known that mass flow controllers are used with the magnetron sputtering apparatus).

31. Pertaining to claim 73, Tamura teaches the apparatus of claim 69 wherein said modulation arrangement comprises an adjusting member for an electrical feed of said target (because the target is biased with respect to the magnetron, the erosion of the target can be varied by the amount of voltage applied to the target, which is well known in the art).

32. Pertaining to claim 74, Tamura teaches the apparatus of claim 69 wherein said magnet arrangement is shaped symmetrical to an axis which is parallel to said sputtering surface.

33. Pertaining to claim 75, Tamura teaches the apparatus of claim 69 wherein said magnet arrangement is shaped symmetrical with respect to two mutually perpendicular axes to said sputter surface (this can be seen in **FIG. 9**, where the magnets are spaced apart symmetrically).

34. Pertaining to claim 76, Tamura teaches the apparatus of claim 69 further comprising a gas inlet that is positioned adjacent to said magnetron source, said gas inlet being connected to a gas tan arrangement comprising a reactive gas (the Examiner is puzzled as to where else to store gas other than a gas tank).

35. Pertaining to claim 77, Tamura teaches the apparatus of claim 69 wherein said target comprises a circular target (again the Examiner believes that the shape of the target is not the inventive feature since it is well known that many vendors supply sputtering targets in various shapes).

36. Pertaining to claim 78, Tamura teaches the apparatus of claim 69 wherein said target is formed of a single material (it is well know that magnetron sputtering targets can comprise single materials).

37. Pertaining to claim 79, Tamura teaches the apparatus of claim 69 wherein there is direct sight communication between said sputter surface and said substrate conveyor arrangement.

38. Pertaining to claim 80, Tamura teaches the apparatus of claim 69 further comprising a monitoring arrangement that monitors a local distribution of material deposited on a substrate at said substrate conveyor arrangement, an output of said monitoring arrangement being operationally connected to an input of a comparing unit, a second input of said comparing unit being operationally connected to an output of a setting unit, an output of said comparing unit being operationally connected to a control input of an adjusting unit of said modulation unit (please note that originally about 20 years ago, the quartz crystal microbalance had an RS-232 interface card in which you could connect to a computer, you could also set your desired thickness so that the equipment would trigger the source equipment to end a particular process).

39. Pertaining to claim 81, Tamura teaches the apparatus of claim 69 wherein said conveyor arrangement is operationally connected to a cyclical drive (this would be inherent since the objective is to have uniform thickness along the roll-to-roll substrate).

Claim Rejections - 35 USC § 103

40. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

41. Claims 67 and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura et al., U.S. Patent 6,093,290.

42. Tamura discloses a semiconductor process substantially as claimed. However, Tamura is silent as to the film thickness uniformity measurements.

43. Pertaining to claim 67, Tamura fails to disclose the method of claim 40 wherein said coated substrate has a coating thickness deviation from an average coating thickness value which is less than or equal to 1% considered along a substrate surface that is greater than 1,000 cm^2. Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

44. Pertaining to claim 68, Tamura fails to disclose the method of claim 40 wherein said coated substrate has a local deviation of deposited amount of material of at most 0.01% with respect to an average value along a substrate surface of at least 10 cm2. Again, the obvious rejection of claim 67 is also applied to claim 68. Merely measuring optimum parameters does not provide a new invention. Given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers

involved. See *In re Aller, Lacey and Hall* (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986)

Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Objections

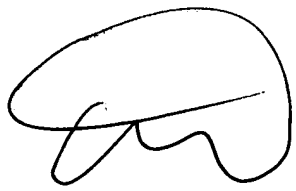
45. Claims 57, 60 and 61 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

46. Any inquiry concerning this communication or earlier communications from the examiner should be directed to W. David Coleman whose telephone number is 571-272-1856. The examiner can normally be reached on Monday-Friday 9:00 AM-5:30 PM.

47. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt Smith can be reached on 571/272-1907. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

48. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



W. David Coleman
Primary Examiner
Art Unit 2823

WDC